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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/574,805

04/05/2006

Koichi Nagata

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06/09/2009

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EXAMINER

SAHA, BIJAY S

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/574,805	<b>Applicant(s)</b> NAGATA, KOICHI	
	<b>Examiner</b> BIJAY S. SAHA	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 19-48 is/are pending in the application.
- 4a) Of the above claim(s) 20,23-28,30,32,34 and 36-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 19,21-22,29,31,33,35 is/are rejected.
- 7) ☒ Claim(s) 40-48 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____.                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____.  | 6) <input type="checkbox"/> Other: ____.                          |

### **DETAILED ACTION**

The amendment filed on March 19, 2009 under 37 CFR 1.312 has been entered.

### ***Status of Application***

The amended and original **claims 19, 21, 22, 29, 31, 33, 35, 40-48** are pending and presented for the examination. The original **claims 1-18, 20** have been cancelled and **23-28, 30, 32, 34, 36-39** have been withdrawn.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claim 19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tour et al US 5,904,852 (hereafter US '852) in view of Konarev et al (Mol Complexes, Jour Solid State., 168, 2002, 474-485) (hereafter JSC '474).

Regarding **claim 19**, US '852 teaches a process for separating C60, C70 and higher fullerenes greater than C70 in an organic solvent as the mobile phase and a mixture of fullerenes dissolved in the mobile phase (Abstract, Col 3, line 49, claim 1).

US '852 does not teach separating C60, C70 and higher fullerenes utilizing amines.

JSC '474 teaches the formation of a complex of fullerenes with amines containing two or more nitrogen atoms where fullerene complexes with amine were synthesized by solvent evaporation of fullerene and corresponding amine (page 476).

At the time of invention it would have been obvious to a person of ordinary skill to perform the fullerene separation (US '852 teaching) via the route of amine complex formation (JSC '474 teaching). The motivation for doing so would have been to enhance the selectivity of the fullerene type associated with separation efficiency when mixture of C60, C70 and higher fullerenes greater than C70 are present since, as in most organic chemistry reactions, fullerene complex formation is dependent upon the amine and the type of fullerene.

**Claims 21 is** rejected under 35 U.S.C. 103(a) as being unpatentable over US '852 in view of JSC '474 as applied to **claim 19**, further in view of Bhasikuttan et al (Interaction of Triplet State, Journal of Photochemistry and Photobiology, 143, 2001, 17-21) (hereafter JPP '17).

Regarding **claim 21**, US'852 in view of JSC '474 teaching is delineated above, earlier 103 rejections.

US'852 in view of JSC '474 does not explicitly teach dissociation of fullerene and amine complex.

JPP '17 discloses dissociation of fullerene complex into fullerene and amine (reaction 12, page 20).

At the time of invention it would have been obvious to a person of ordinary skill to perform the fullerene separation (US '852 teaching) via the route of amine complex formation (JSC '474 teaching) and subsequent complex dissociation (JPP '17 teaching). The suggestion or motivation for doing so would have been to separate the amine and C60, C70 and higher fullerenes complex via the teachings of JPP '17.

**Claim 22 is** rejected under 35 U.S.C. 103(a) as being unpatentable over US '852 in view of JSC '474 and JPP '17 as applied to **claims 19 and 21**, and further in view of Choudhury et al WO2002/079142 (hereafter WO '142).

Regarding **claim 22**, US'852 in view of JSC '474 and JPP '17 teaching is delineated above, earlier 103 rejections.

US'852 in view of JSC '474 and JPP '17 teaching does not explicitly teach the dissociation of fullerene complex by acid.

WO '142 teaches reaction of amines and acids including carboxylic acid and hydrochloric acid (Page 1, para 1 and 2).

At the time of invention it would have been obvious to a person of ordinary skill to to perform the fullerene separation (US '852 teaching) via the route of amine complex formation (JSC '474 teaching) and subsequent complex dissociation (WO '142 teaching). The suggestion or motivation for doing so would have been to dissociate the fullerene complex by acid treatment which is a more convenient method of complex dissociation.

**Claims 29, 31, 33 and 35** are rejected under 35 U.S.C. 103(a) as being unpatentable over US '852 in view of JSC '474 and further in view of Nakamura et al US 6,765,098 (hereafter US '098).

Regarding **claim 29**, teachings of US'852 in view of JSC '474 have been delineated above.

US'852 in view of JSC '474 does not explicitly teach multiple amine complex formation.

US '098 teaches multiple amine compounds that are utilized to form the complexes with fullerenes where two nitrogen atoms in the amine are bonded through one carbon atom of the alkylene group (Col 6 structure shown in lines 10-15).

At the time of invention it would have been obvious to a person of ordinary skill to perform the fullerene separation (US '852 teaching) via the route of amine complex formation (JSC '474 teaching) utilizing the art of multiple amine compounds for synthesizing fullerene complexes. The suggestion or motivation for doing so would have been to form fullerene complex for multiple application and utilize broad based amines in the complexed form to enhance the separation of fullerenes.

Regarding **claim 31**, US '098 discloses two nitrogen atoms are bonded via alkyl group A that contains carbon (Col 6 lines 35-40). Although nitrogen in the example is attached to two groups R1 and R2 via single bonds, an amidine structure may have only one functional group attached to the nitrogen via a double bond. A nitrogen atom may be attached to a carbon via a double bond by having only one functional group attached to the nitrogen atom.

Regarding **claims 33 and 35**, JSC '474 discloses multiple molecular amine structure. It is expected that any of the structure discussed (Page 475 Scheme 1) can be enable by one skilled in the pertinent art [**MPEP 2164.01**]; for example, Te in the EPTA (Scheme 1, page 475) can be replaced by another N by those skilled in the art and would have the same expectation of results.

### ***Allowable Subject Matter***

**Claims 40-48** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance.

Dependent claim 40 draws to the amine complex formation of fullerenes higher than C70 dissolved in an organic solvent based upon a two step process where the first step constitutes of amine complex formation of higher than C70 amines and second



Art Unit: 1793

step being the amine complex formation of lower than C70 fullerenes. While the prior art teaches the dissolution of higher than C70 amines in an organic solvent, prior does not teach the amine complex formation of higher than C70 fullerenes.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Response to Arguments***

Applicant's arguments filed March 19, 2009 have been fully considered but they are not persuasive.

New dependent **claims 40-48** are drawn to allowable subject matter if written in the independent form.

US '852 (Tour et al) teaches the art of separation of C60, C70 and higher fullerene and provides the motivation for separation of fullerenes. JSC '474 (Konarev et al) teaches the complex amine formation of C60 and C70 fullerenes with amines for the application in photo induced electron transfer. JSC '474 demonstrates in a practical way to form complexes based upon the nature of fullerenes being C60 or C70. US '852 provides a method for dissolving the C60, C70 and higher fullerenes in a solvent for

Art Unit: 1793

separation. Production of fullerenes is associated with simultaneous production of C60, C70 and above fullerenes; hence, purification of fullerenes is key to the application of individual fullerenes as shown by US '852.

While US '852 and JSC '474 provide art and motivation for separation via complex formation, neither of the two (US '852 and JSC '474) show a practical method of recovering back specific fullerenes after it has formed a complex with a specific amine. JPP '17 (Bhasikuttan et al) teaches a simple way to dissociate the amine fullerene complex to recover the specific fullerene.

In the reaction 12 of JPP '17 exciplex is an intermediate step. At the end C60 and amine are separated. Combination of US '852, JSC '474 and JPP '17 provides the motivation and a simple way to dissolve, forming a complex and separation of fullerenes for fullerenes purification.

WO '142 (Choudhury et al) provides the art for amine separation via the formation of a filtrate product after the reaction with amine and an acid. The art when applied to the US '852 and JSC '474 motivation to a person of ordinary skill for fullerene separation.

US '098 (Nakamura et al) provides the art for reaction between the fullerene and multiple nitrogen atoms. The art provides more synthesis latitude for the fullerene separation and purification.

Dependent **claims 40-48** have been allowed if written in the independent form.

### ***Conclusion***

Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BIJAY S. SAHA whose telephone number is (571) 270-5781. The examiner can normally be reached on Monday- Friday 8:00 a.m. EST - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on (571) 272 1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

Art Unit: 1793

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BIJAY S SAHA/  
Examiner, Art Unit 1793

BSS  
June 5, 2009

/Melvin Curtis Mayes/  
Supervisory Patent Examiner, Art Unit 1793